THE AMERICAN JOURNAL OF

OPHTHALMOLOGY.

VOL. VI. DECEMBER, 1889. NO. 12.

REGULAR ASTIGMATISM FOLLOWING CATARACT EXTRACTION.

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It is a fact well known to ophthalmic surgeons, though for the most part in a general way only, that a certain amount of regular astigmatism is the result of the operation of cataract extraction.

If one is to judge, however, from what one sees in the text-books and from conversation with operators, it is not considered of sufficient importance to be taken account of in the fitting of glasses, except in occasional cases. The fair inference is that it is not the custom to search for its presence in a routine manner. The vision of a majority of those operated on for cataract does not, perhaps, exceed $^{5}/_{XVIII}$, but as this is usually sufficient for the needs of ordinary life, there is a feeling of satisfaction and content on the part of both surgeon and patient, and no effort is made to secure any thing better than can be had with spherical lenses alone.

In a paper read before the American Ophthalmological Society in 1888,[1] on the refraction of the healthy cornea, I stated that I would, in the future, report on the changes in the refraction produced by disease and especially by operations. This report I am not yet ready to make in full, but the recent appearance of a valuable and carefully prepared paper by Prof. Erasmo Scimeni[2], of Cagliari, on the corneal astigmatism following cataract extraction, has suggested the propriety of calling the attention of operators to the subject now, with a view of inducing a more careful and, indeed, a routine testing for astigmatism in all cataract cases.

As Prof. Scimeni's statistics are more extensive than any I could at present offer, being the result of the examination of the eyes of 146 persons operated on for cataract, and particularly as his results are so nearly in accord with my own, I deem a record of my individual cases unnecessary.

My ophthalmometric measurements agree with those of all other investigators, in showing that the astigmatism of the healthy cornea has its greatest refraction in the vertical meridian (axis horizontal). My examination of the corneæ of eyes which have been operated on for cataract on the other hand agree with those made by Scimeni, in showing the meridian of greatest refraction to be the horizontal (axis vertical) or approaching it. As the incision in cataract extraction lies either upward or downward, the inference is that the manner in which the wound heals has something to do in bringing about this change.

Weiss[3] supposed this to be due to a failure in exact coaptation of the wound, the lip of the flap coming forward in advance of the scleral edge of the incision. This would

[1]An analysis of the refraction of 576 healthy human corneæ examined with the ophthalmometer of Javal and Schiotz. Transactions American Ophthalmological Society, 1888.

[2]Sull' Astigmatismo corneale in seguito ad estrazione di caterratta; osservazioni oftalmometrische su 146 operati. Annali di Ottalmologia, Anno XVIII, fasc. 4, 5, 1889.

[3]Weiss. Corneal Astigmatismus nach Staarextractionen. Archiv. f. Augenheilkde B. vi, page 58.

of course increase the radius of curvature and diminish the refraction in the vertical meridian. Scimeni, however, has shown by calculation, that in the larger number of cases the great amount of astigmatism found could not be prduced in this manner, since it would necessitate such an advance of the flap lip as to remove its inner edge beyond the outer edge of the scleral lip of the wound. Such a condition would, and undoubtedly does, in many instances, cause some of the astigmatism by increasing the radius of curvature in the vertical meridian but does not produce it all, for Scimeni has found and my own observations confirm his in the main, that there is nearly always associated with the diminution of refraction in the vertical meridian, an increase in the refraction in the horizontal.

Scimeni attempts to account for the phenomena by a contraction of the recti muscles causing a gapping of the wound and a separation of its edges, and not simply by a sliding of the anterior lip forward over the posterior as advocated by Weiss. Such a gapping of the wound would undoubtedly produce both a lessening of the curvature in the meridian in which the incision lies, and, by traction, a corresponding increase in the direction at right angles to this. But whether this gapping is caused by contraction of the recti muscles, or by pressure of the lids, or by some fault in the incision itself or by all three, is still to my mind, an open question.

The clinical fact, however, still remains that the astigmatism is caused by a failure of the wound to heal properly. There is not union by first intention throughout its entire extent, but the healing occurs by the interposition of lymph, which undergoes a cicatricial contraction, and *pari-passu* with this contraction we find a diminution of the astigmatism, which comes about generally by a concomitant increase in refraction in the vertical and diminution of refraction in the horizontal meridian; leaving almost always, however, the vertical meridian still less refracting. We can say, therefore, that:

The Astigmatism Following Cataract Extraction is Contrary to the Rule.

The amount of astigmatism that remains as a per-

manency rarely exceeds 3D, but that is quite enough to seriously reduce the visual acuteness. I have stated in my "Treatise on Astigmatism," that an astigmatism of 1D or less can usually be neglected in cataract cases, and I still adhere to that opinion, but where it exceeds 1D, I believe it should, in every case, be corrected. The practical point I wish to make is, that the visual acuteness in cataract cases cannot be considered as definitely fixed within 3 months after the operation, the cicatrziation in some cases not being completed before the end of that time. This fact accounts in many instances for the unsatisfactoriness of the glasses first ordered and the necessity for a change some weeks later. A testing which is final 2 or 3 weeks after an operation, however skillfully done, if made without a search for astigmatism, is likely to do the operator injustice, and to deprive the patient of an amount of visual acuteness to which he is justly entitled. The following case will illustrate these points:

Rev. A. C., æt. 64, having a M=5D, was operated on for cataract by extraction, on March 14, a preliminary iridectomy having been made 4 weeks previously. Healing normal, with the exception of a very slight iritis. On April 8, an examination with the ophthalmometer of Javal, gave the following measurements:

Meridian with axis at 165° 38.5D; 75°, 48D. The normal refraction of the cornea is about 43D, so that it was 5.D greater in one and 4.5 less than the normal in the other meridian, the meridian approaching the vertical being the weaker in refraction. No spherical glass brought V up to $^{5}/_{LX}$, but with +3⌒ +9. 165° V=$^{5}/_{XII}$. These conditions remained about the same for several weeks and as he wished to use his eyes at once, I gave him +3⌒+6. 65° (6.D being the strongest cylinder that is manufactured for the trade), which enabled him to see quite nicely (V=$^{5}/_{XXIV}$+), and with the proper spherical added, allowed him to read his sermons in the pulpit. These he continued to use with satisfaction up to the time he left for his vacation on the first of June. I left on my own vacation in July and on my return in October he reported with much dissatisfac-

tion with his glasses, which, he said, had been gradually failing him for the last month. An ophthalmometric examination showed:

Horizontal meridian 45.25.D, vertical 42.D., being an astigmatism of only 3.25.D. The horizontal meridian had, in that time, lost 3.25D., of refraction and the vertical had gained 4D. With $+7.\bigcirc+3$, 180° V=$^{6}/_{XII}$, and he claims to see better than he ever saw before. The other cornea shows a normal refraction with less than 0.5D astigmatism according to the rule.

Where there is, from any cause, an interference with the normal healing of the wound there is always a high degree of astigmatism. In one case recently where I made an extraction without an iridectomy there was a prolapse of the iris which I was compelled to excise on the fifth day. There was 2 weeks after the operation, an astigmatism of 18D. The meridian with its axis at 160° having 36D., the one at 75° having 54D. The final examination for glasses has not yet been made. In another case an astigmatism of 2.5D, 135°, completely disappeared as a result of the operation, the cornea having 43.5D. in all its meridians.

It has not yet been determined that one method of extraction has any advantage over another in lessening the tendency to change in the form of the cornea, for those cases where extraction is made without iridectomy are as frequently attended with astigmatism as when it is made with iridectomy.

ACUTE GLAUCOMA OF THE RIGHT EYE IN AN INDIVIDUAL ÆT. 28 YEARS, IN WHICH THE LEFT EYE HAD BEEN DESTROYED BY TRAUMATISM THREE YEARS PREVIOUSLY. ATTEMPTED IRIDECTOMY FOLLOWED BY COMPLETE DISPLACEMENT OF THE LENS INTO THE VITREOUS.

BY B. E. FRYER, M.D., KANSAS CITY, MO.

F. B., a very dense German farmer, was brought to me from Nebraska, by a very intelligent minister, December 5, 1889. The man, though not robust, was in a fairly good state of health, æt. 28 years. He was free from constitutional taint, no rheumatism, no syphilis. The left eye had been destroyed three years before by a fragment of iron cutting it. It was not known whether a foreign body had remained lodged within the eye. This eye shows staphylomatous enlargement in the upper and outer portion of the ciliary region. The lens is dislocated into the anterior chamber. Tension +1. Vision of this eye is only a very trifling light perception. It is sensitive to pressure, but not markedly so. There is no external congestion.

The right eye became painful five weeks ago. He has had more or less continuous headache; also vomiting several times. This eye is congested externally; the pupil is irregularly dilated. The anterior chamber is shallower than normal. The lens is partially opaque; the fundus not discernable. T.+3. V.=counts fingers at four feet. The eye is still painful, and there is browache, but he has not vomited for a few days.

The gravity of the situation was fully explained to the pa-

tient, who did not seem to be able to appreciate the condition at all, nor could he be made to realize it, though his friend who brought him informed me that a younger brother of this man had become blind from sympathetic ophthalmia following a trauma.

Believing that the destroyed eye might probably be a factor in causing the glaucomatous condition of the other eye, I proposed enucleation of the left eye, and an iridectomy of the right. At first all operative interference was rejected, but finally next day his consent for an iridectomy was given.

The operation (iridectomy) was commenced after a thorough cocainization. The incision was made by a curved lance-shaped keratome extremely keen in point and edge, the knife was passed in through the corneo-scleral junction at the upper portion and the point was directed away from lens and close to cornea after its entrance into the anterior chamber. An incision of about 7 millimetres was made. The withdrawal of the keratome was slow, and but little aqueous followed it. The patient, however, at this step of the operation made considerable pressure with his lids. The fixation forceps was removed at once and while I was about to enter the iris forceps to seize the iris, a small bead of quite fluid vitreous escaped. The speculum was now removed. Since I believed it safer not to make any further effort to withdraw a portion of the iris the eye was bandaged.

The day following the eye was free from pain; tension was normal. The wound was closed; the pupil more contracted. But it was found on illuminating the eye, that the lens was completely detached from the zonule of Zinn, and was displaced downward and backward, and lying upon the floor of the vitreous chamber. Quick rotation of the head or eye demonstrated that the lens moved freely in its new location. With a +12 D. vision was somewhat better than before the operation of the previous day. The subconjunctival redness was less.

The patient returned home the following day, against my advice, so that a further history of the case cannot be given.

As to just how or even exactly when the lens was displaced,

it is impossible to say. It was *in situ* the day before the operation. There was no external pressure exerted upon the lens during the operation; there was no touching of the lens by any instrument. It would seem possible when the small quantity of the aqueous which escaped on removal of the keratome, that the balance of anterior and posterior pressure being upset, the pressure posteriorly ruptured the zonule, setting the lens free, and the patient being in a half reclining position in the operating chair, it sunk back into the vitreous, which latter was more fluid than normal. This is surmise, however.

The examination showed that the lens was completely displaced and no portion of zonule connected with it.

It is to be regretted that no further account of the case can be given. The man could hardly be persuaded to remain to have anything done for him from the first as no promise could be held out of restoring his vision by operation. It was with difficulty, so dense was he, that he was dissuaded from going home the day of the operation. When he left the eye was quiescent, no pain and no increase of tension.

I place the case on record hoping that if others may have met with anything similar, where an iridectomy for glaucoma has been followed by dislocation of the lens into the vitreous, it may also be recorded.

As to whether or not the destroyed (left) eye was a factor in the production of the glaucoma in the fellow-eye cannot, of course, be decided. This man was well below the average age for glaucomatous attacks and, as far as can be ascertained, is without hereditary predisposition to glaucoma. The general belief is that glaucoma is not produced symphathetically—but is sympathy never a factor?

ON CHRONIC AND RECURRENT HYPERÆMIA OF THE BULBAR CONJUNCTIVA DUE TO SYPHILIS.

BY ADOLF ALT, M.D.

In the extremely valuable book on "Syphilis and the Eye," by Dr. Alexander,[1] which, besides giving the author's very large experience, goes over this whole interesting field in all its details, several forms of *conjunctival* affections are mentioned as having been reported in literature.

Mauthner and Lang have described an obstinate catarrhal conjunctivitis, as due to syphilis and a sign of the generalisation of the specific virus. The originals of these communications I cannot find.

In *Hirschberg's Centblt. f. Augenheilkunde* April, 1888, Goldzieher reports two cases of what he considers as true syphilitic conjunctivitis and as a form of the disease hitherto not described. The characteristic symptom of this conjunctivitis is the formation of granules in a diffusely infiltrated conjunctiva with a colloid appearance. This affection yields to no other treatment than an anti-sypilitic one. He compares this affection to the specific swelling of the lymphatic glands in other parts of the body, and considers as a sign of universal syphilis. Macauley and Sattler each describe similar cases. Sattler, moreover, states that the histological examination proved these granules to consist of endothelial cells, and, therefore, to differ totally from trachoma granules.

Primary affections situated in the conjunctiva, that is chancres, secondary affections in the form of papules and eruptions

[1]Verlag von J. F. Bergmann, Wiesbaden, 1889. (The Editor takes this occasion to thank the Publisher for sending the work).

similar to those of the skin, as well as gummatous tumors have been described. Alexander could sum up 37 cases of these affections.

A number of years ago I saw for the first time a condition which I do not find mentioned in Alexander's work, and for a description of which I have looked in vain every since. Whether Mauthner's and Lang's cases of "obstinate catarrhal conjunctivitis" were similar to my cases, I do not know. I do not intend to claim priority, but to add my mite of knowledge to that of others, and thus the description of my cases may not come amiss.

1. Mrs. A. H., æt. 67 years, a midwife, called on me July 21, 1881. The reason was, as she stated, the second attack of a very annoying and unsightly affection of the eyes. The former attack, a year ago, had lasted about six months and then disappeared. The present attack was of six weeks' standing, before she called on me.

I found the following conditions: Both bulbar conjunctivæ were slightly œdematous and of a scarlet red. It seemed as if every blood vessel lying in the bulbar conjunctiva was dilated and filled to its utmost capacity with blood. The palpebral conjunctivæ were but slightly injected, and their condition was in no way to be compared to the enormous hyperæmia of the bulbar conjunctivæ. There was no discharge whatever. The pupil answered but sluggishly to the stimulus of light. Vision was perfectly normal, there was no error of refraction and no intra-ocular trouble, more especially no sign of any choroidal inflammation to be seen in either eye. Tension and field were normal.

The subjective symptoms the patient complained of, were a continued feeling of heat, dryness and grittiness, and these symptoms became aggravated as soon as the patient tried to make use of her eyes for any close work, when profuse lachrymation was added to their number.

The patient had gone through several modes of local treatment without the least change in her condition. I employed first cold bathing, then hot bathing, instillations of pilocarpine

and inspergations of calomel with little benefit. I then tried massage with the yellow oxide of mercury ointment. The patient considered herself decidedly better under this treatment, but being engaged in a case of confinement she had to discontinue her visits at my office. It was only then, when perscribing for her and giving her directions as to the further treatment, that I happened to suspicion syphilis as, perhaps, being the cause of the trouble. The patient at once told me that she had been infected 4 years previously, but thought herself cured of the disease. I then told her to discard all local treatment, and under continued treatment with mercurials the affection of the eyes slowly disappeared.

2. In 1886, on March 24, Dr. W. C., æt. 53 years, consulted me on account of an affection of the right bulbar conjunctiva of exactly the same nature as described in case 1. The doctor had had the misfortune to wound himself in delivering a syphilitic woman 3 years previously.

The disease had so far apparently run a mild course under the influence of early mercurial treatment. The patient had, however, stopped all mercurial treatment for about a year, when the eye trouble began. He had at the time gummata in the skin which seemed to have no tendency to ulcerate. The patient was especially worried by the inability to read even for a few minutes on account of the irritability of the eye. There was no intra-ocular disease, and no error of refraction. Aside from recommending a mercurial course, I tried massage in this case at first with iodol and then with yellow oxide of mercury. Both remedies, however, proved so irritating, that I had to give it up. The eye-affection in this case, also, yielded slowly, but completely to mercurial treatment.

3. L. L. S., æt. 62 years, consulted me on February 8, 1889, on account of an eye-affection concerning the right bulbar conjunctiva principally, but also to some degree the left one. I at once put the question to him: When did you have a chancre? and received the answer: A year ago. The symptoms in this case did not differ from those related above. No other affection of the eye could be found, the fundus being absolutely normal. No error of refraction.

Under mercurial treatment, at once instituted, the hyperæmia of the bulbar conjunctiva at once disappeared almost perfectly, that is, a few enlarged vessels remained dilated. The disagreeable subjective symptoms, however, vanished altogether, so that the patient attended to his business again. No local application was made use of.

Three weeks ago this patient returned with the same trouble in the same eye. From the history he gave, he had evidently gone through an attack of brain-syphilis, and he was still so weak that he could barely get about. He is now under treatment with iodide of sodium and is improving.

4. On August 17, 1889, T. M., æt. 55 years, presented himself at the clinic of the Beaumont Hospital Medical College, with both bulbar conjunctivæ slightly œdematous and highly congested. He stated that he had had similar attacks off and on for years. The first one came on two years after infection with syphilis. He had been treated locally without effect. Mercurial treatment was prescribed, but the patient never returned.

In the four preceding cases the symptoms were all alike, and an infection with syphilis was acknowledged. The three cases which remained under my personal observation, healed under mercurial treatment while local treatment was of no avail whatever in any of the four. There was no complication with this hyperæmia of the bulbar conjunctiva on the part of any other membrane of the eyes attacked. This form of hyperæmia of the bulbar conjunctiva must, therefore, be considered as a disease *per se*, not a symptom of another intra-ocular eye-effection. It evidently is a peculiar localization of the syphilitic virus. The attention being drawn to this fact, I suppose others will be able to report similar experiences.

The following case I wish to relate, although I do not believe, that it belongs to the same class:

On November, 8, 1889, P. M. W., æt. 48 years, consulted me on account of an intense hyperæmia of the left eye. I thought at once the case belonged to the same class as those just related. The patient, a strong and healthy man, however, abso-

lutely denied a specific infection, nor was there any sign of syphilis to be found. The patient stated that such attacks had occurred at intervals of months for 15 years, and that none of the many modes of treatment he had undergone had helped him in any way. He had been subject to rheumatism for about the same period. The present attack was 4 days old. In this case the attacks came on with intense pain, which subsided the second day. Then followed a continued feeling of grittiness and heat, and this and the inability to use the eyes were the symptoms which remained for weeks, and then gradually disappeared. The function of the eyes was otherwise normal. While, however, in the preceding cases the fundus was totally normal, in this case the optic disc was red and the retinal veins were dark, enlarged and tortuous.

I prescribed hot bathing, massage and, internally, salicylate of sodium. I saw the patient again about a month after. His condition had rapidly improved after his first visit, but he had now a new attack in the right eye. I recommended the same treatment, but increased the dose of the salicylate of sodium. The patient has not since returned.

To avoid being misunderstood, I will state that the hyperæmia, as described above, is in no way to be confounded with the œdematous and hyperæmic condition so often seen in drinkers, nor, of course, with a catarrhal affection, there being no discharge. The palpebral conjunctiva was normal, or barely injected in all of these cases.

TRANSLATION.

ON COLORING THE DISEASED CORNEA BY FLUORESCEINE AND THE USEFULNESS OF THIS COLORATION IN MAKING DIFFERENTIAL DIAGNOSES.

BY DR. THOMALLA, FRIEDLAND.

(*Hirschberg's Centralblatt.*)

Dr. Straub, Military Surgeon in the Netherlandish army, having proven, that it was possible to color portions of the living cornea which are devoid of epithelium a pronounced green by means of fluorescine, I made experiments with a view to finding the exact value of this coloring substance in helping to diagnose a number of further corneal affections. In these experiments I made use of:

1. Merck's fluorescine, looking yellow in substance.
2. Gruebler's fluorescine, looking red in substance.
3. Gruebler's fluorescëine, looking light red in substance.

The fluorescëine I considered the most useful. I applied it in a two per cent solution; this had to be made in a three and a half per cent solution of carbonate of sodium. Since the many hundreds of patients on whom the experiments were made never complained of pain, this high percentage of alkali was not in my way.

With regard to the coloring qualities of my solution, I want to state at first, that a perfectly normal and uninjured cornea does not get colored by it, as proven by trial in 40 to 50 cases. I further saw in about 50 experiments, that it is impossible to

stain old and perfectly cicatrized wounds, or maculæ corneæ.

My solution colors the cornea wherever there are defects in its epithelial coat. In one case of a burn with lime, the burnt place was also colored green, but, while the corneal tissue proper was stained a deep green, it was covered by a loose epithelial cover which did not accept the stain.

I made the same experiment on the eyes of pigs (after removal) and of living rabbits with exactly the same results. Defects in the epithelial coat artificially produced, and parts burnt with the galvanocauter were colored green, until the epithelium was reformed.

Ulcers of the cornea showed the same pronounced coloration as did the artifical defects, until they were perfectly healed and all irritation was gone. Once only, to my astonishment, the strange thing occurred, that the site of an ulcer which was apparently perfectly covered by epithelium, got colored peripherically after a prolonged action of the solution. Since in the healing of an ulcer the epithelium grows from its periphery, this case can be explained only on the supposition, that the ulcer had healed in an anomalous way, and that certain parts were still diseased when others were already covered by epithelium.

The corneal tissue is furthermore colored when it contains *a foreign body*. After a drop of the fluorescëine solution has been dropped into such an eye, an area of green is always found around the foreign body. When the latter has been removed an evenly green color is seen, where it lay. If, however, but a small particle of the foreign body remains behind, a dark point shows plainly within the green. After its removal only does this portion, too, get green. When a foreign body has been completely removed, and yet the symptoms of irritation do not decrease after a few days, and if then its site can be colored green, we can with certainty diagnose an ulcerating keratitis.

Perforating wounds of the cornea show a coloration which begins at the wound-lips and spreads toward the uninjured parts of the cornea. This coloration can be produced until the cica-

trization is absolutely accomplished and every particle of inflammation is gone. Scars in the cornea never accept the color.

In all forms of *inflammatory processes* in the cornea, as in keratitis exulcerans, fascicularis, and interstitialis diffusa, the diseased portion shows a pronounced green color at once after the solution has been instilled. This is the case especially in all those inflammatory processes which are combined with an infiltration. In the same way the green coloration is easily produced where there is pannus, whether it is caused by trachoma or by scrophulous keratitis.

In cases of *iritis serosa* that portion of the iris the posterior surface of which is "dusty," shows a distinct green color, when there is an abnormal condition of the epithelium accompanying it. In some cases of chronic iritis, too, a slight coloration was visible.

Unfortunately I have never had an occasion to try the solution in a pure case of *specific iritis*, since this affection was always combined with some form of keratitis or pannus. In these cases coloration always took place. Yet I could not determine whether it was owing to the keratitis or the iritis.

When experimenting on eyes with *glaucoma*, I found that in acute glaucoma a part of the cornea became colored always, and generally the color from there entered the remainder of the cornea. During these experiments one patient complained of complete symptoms of glaucoma in the left and the appearance of colored rings in the right eye. The examination with the ophthalmoscope revealed positive proofs of acute glaucoma in the left eye, while in the right eye nothing could be seen. The fluorescëine coloration of the left cornea was very pronounced, while that of the right eye was but slight. Ten hours later—the left eye had meanwhile been operated on—the right eye had a severe attack of acute glaucoma.

In several cases of *chronic glaucoma* no coloration could be obtained. In a few where a coloration appeared, it was much lighter than in acute glaucoma.

Of the *affections of the conjunctiva* the *phlyctacnulæ* take up

the color, but it needs a much more prolonged influence of the fluorescëine solution than in the corneal affections. Instead of the green color, we saw in the cornea, the color produced in the conjunctival phlyctænulæ was yellowish-brown. The results of my numerous experiments in follicular conjunctivitis, trachoma, and spring-catarrh were invariably negative. In spite of the prolonged influence of simply concentrated solutions not the least coloration could be obtained.

The cornea never took up color in cases of *hypopyon.*

The spreading of the color over the healthy cornea is undoubtedly brought about by the lymph-chanels of this membrane, as has been proven by actual observation and by means of the microscope. The question is, however, in what manner this takes place. I injected my solution into the anterior chamber of rabbits by means of a Pravaz–syringe, and saw that the color spread into the cornea from the canal made by the needle. As in other experiments, it was only the connective tissue of the eye which took up the color, while the epithelium and endothelium remained uncolored. As I stated above, in cases of burn with lime the color entered under the detached layer of epithelium and thus reached the connective tissue. In the same way the coloration takes place, when the epithelium is excoriated. The same explanation may hold good in corneal ulcers. In these cases, too, the epithelium is partially diseased, partially detached, and thus the corneal connective tissue is colored until the ulcer is again covered by newly formed epithelium. During inflammatory processes in the cornea the epithelium is diseased over the site of the inflammation, and in consequence the cementing substance lets the coloring material pass through easily; thus the connective tissue is stained, while, as in the case of a burn with lime, the epithelium remains uncolored. The coloration where there is a foreign body can be explained in the same way. The cornea is injured where a foreign body enters. Thus the epithelium is removed from a small area around the foreign substance, sufficiently so as to allow the coloring substance space enough to enter. But even if this small defect in the epithelial coat,

by which the coloring fluid may enter, should be wanting, the coloration may be explained by the fact, that an inflammation is set up in the cornea by the presence of the foreign body, and that the cornea is colored as it happens in keratitis. The coloration in iritis serosa is certainly also to be explained by the fact that alterations in the cornea, which are probably of an inflammatory character, give rise to a diseased condition of the epithelium which then allows the coloring substance to enter.

The changes in the nutrition of the cornea are, I think, sufficient to explain why the staining takes place in acute glaucoma.

According to the views of Heidenhain, Snellen and Meynert concerning the paralysis of the intracranial trigeminus nerve (by cutting) we may assume, that in cases of glaucoma the high intraocular pressure produces a partial paralysis of the peripheral nerve filaments in the cornea. This is undoubtedly true with regard to the sensitive nerves, as is proven by the diminished sensibility of the cornea in glaucoma. The function of the trophic nerves might be interfered with in the same manner. Whether or not the eye be exposed to external injuries, this would cause an alteration in the nutrition of the cornea, causing in turn a diseased condition of the epithelium, and thus the taking up of the color might be explained.

My method of coloring the corneal tissue may be useful in making the following differential diagnoses.

1. In order to find out, whether a corneal affection is old or recent, since a recent keratitis always became colored, while an old macula never took up the stain. In this way the color will show when a recent affection is healed, since the faculty of becoming colored will then disappear.

2. In order to make the differential diagnosis between hypopyon and infiltration of the cornea (! Transl.).

3. In order to distinguish between pinguecula with conjunctivitis and phlyctænulæ, the diagnosis being sometimes difficult in these cases. Phlyctænulæ take up the color, pinguecula does not.

In order to make a diagnosis the fluorescëine solution may be valuable:

1. In cases of excoriation of the cornea; in these cases it will show exactly when the excoriated part is again covered totally by epithelium.

2. In order to make sure whether an ulcer is perfectly healed or not.

3. In order to see when perforating wounds of the cornea are perfectly healed. It will be necessary for the patient to wear a bandage until the wounded parts can no longer be colored.

4. The application of the solution will be of great importance in all cases of foreign bodies in the cornea. It is often impossible to recognize a dark foreign body in the cornea, when the iris is dark also, even by means of oblique illumination. One drop of the fluorescëine solution at once produces a green area around the foreign body so that it is easily recognized and therefore easily removed. When the foreign body is apparently removed, the fluorescëine solution gives the exact proof whether or not a small particle has remained behind. If any has remained behind, a small dark spot can always be seen in the area of green.

5. It is as yet impossible to state in how far the solution will be of value in making a diagnosis in cases of acute glaucoma. It is my opinion, however, that in cases of acute glaucoma the cornea shows a coloration as soon as the tension is increased enough so as to alter the epithelium and to give the surface a greasy appearance, and before a sure diagnosis can be made with the ophthalmoscope.

6. The staining with my solution will find a large field of usefulness in eye-diseases of children. It is well known how difficult it has so far been to recognize slight affections of the cornea. One drop of my fluorescëine solution will make the diagnosis easy, since a recent affection of the cornea, its character, and size will at once become visible.

SELECTION.

NOTE ON TESTS FOR COLOR BLINDNESS.[1]

BY KARL GROSSMANN, M.D., F.R.C.S.E.,

Ophthalmic Surgeon, Stanley Hospital, Liverpool.

At the last meeting of this Association at Glasgow I demonstrated some models of tests for color blindness. Through various circumstances it has not been possible to have them turned out in large quantities up to the present. Meanwhile, some criticism has been brought againt my tests. I should, perhaps, not have answered, considering the criticism appeared in the lay press; but it was asserted to be backed up by a medical authority competent in the matter, but whose identity I am ignorant of. This slight controversy appears to me to be due to nothing else but a mere oversight.

Owing to the great difficulties which I met in the way of the practical multiplications of my models, and which were purely accidental from one cause or another, there was only a few sets made altogether. As I demonstrated at the Glasgow meeting, some of these twin-colored tests were to be used by lamplight, some by daylight. I showed how, by means of pale greenish-blue glasses, the lamplight set could be changed into a daylight set, while a certain pale yellow glass held in front of the daylight set made it answer for gas or lamplight. It seems that these two sets have become mixed up, and the misunderstanding arose through the lantern not being supplied with the blue and yellow glass discs.

[1]Read in the Section of Ophthalmology at the Anual Meeting of the British Medical Association held in Leeds.

As far as the principle of the test is concerned, I need not say anything here. It has been said in those criticisms to which I before alluded that Holmgren's test is the best because it is at once simple and infallible. It certainly is a simple test and a very good one, and I should not like to be without it; but infallible it certainly is not.

Not so very long ago a case came under my notice where a red-green blind person—well educated—acquitted himself perfectly well of the examinations(repeated ones)with Holmgren's wools, but failed to recognize some of my glass letters and other tests. I am sorry to have to keep the gentleman's name to myself, as he strongly objects to having his defect known; but to those who perhaps think my experience in this instance too exceptional I need only refer to similar experiences published by Professor Pflüger of Berne. He found in a post-graduate course on ophthalmology which he was then giving to sixteen army surgeons that there were two of them completely red-green blind, as proved by his own other tests; but when tried with Holmgren's wools, they made not the slightest mistake.

This may suffice to show that Holmgren's test is not sufficient for every case of color blindness. Especially in the case of the educated we have to be extremely careful, and men who prepare for the command of a ship belong this class.

I may just mention another point in connection with this, not of a very first-rate importance in itself, but not to be neglected when it comes to the examination of large numbers. In order to compare the quickness with which different tests could be applied I examined schools. For Holmgren's tests the average time for each schoolboy was about five minutes, so that not more than twelve could be tested in an hour. With the twin-colored tests I could easily go through the ten-fold number in the same time. Once the teacher, who soon very kindly helped me, hit upon a very expedient plan, when I wanted some color-blind boys quickly for some other purpose. He took a few of my glass discs, held the sample disc up, and said to a class where no investigations had been held before: "You see this letter; it is a B. Write it down on your paper. Now I hold up

another letter; write down what this is." Up went four boys who said they could not distinguish any letter at all; and those four were soon found to be red-green blind.

This shows that a considerable advantage may be derived from the promptness which my tests admit when perfect. The only drawback I have been able to detect up to the present is the difficulty in producing them, and the great amount of personal annoyance and fatigue they imposed upon me. For these reasons I have tried to modify them, Instead of the glass mosaic I tried to get pattern printed on gelatine, after the style of the imitation stained glasses. I have not been able to obtain any proper samples to be shown at this meeting to-day. It seems as though manufacturers do not care to put themselvas to great trouble for any scientific or other work which, to all expectations "does not pay." I then made an attempt to have a sample letter printed in some twin colors, without any trace of gloss on them, and for this purpose I thought a white woolen material would be the most suitable. For this I had to go across the Channel to one of the best known firms in Saxony and I have the pleasure in showing you herewith the first batch, which I only got quite recently. The colors are not quite perfect yet, but will be sufficient to show what can be done. I intend going to the manufacturer at an early date and we may be able to obtain something good. These prints could easily be multiplied to any extent, would be cheap, and could be mounted in any suitable form.

I may add that this mode would have the additional advantage of allowing an edition of prints adapted to non-typical color blindness, such as experienced in tobacco amblyopia, etc. At present I have not the time nor a sufficient number of cases to have settled the colors suitable for these defects.—*Brit. Med. Jonr.*

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THE AMERICAN JOURNAL OF OPHTHALMOLOGY.

VOL. VI. DECEMBER, 1880. No. 12.

EDITED BY

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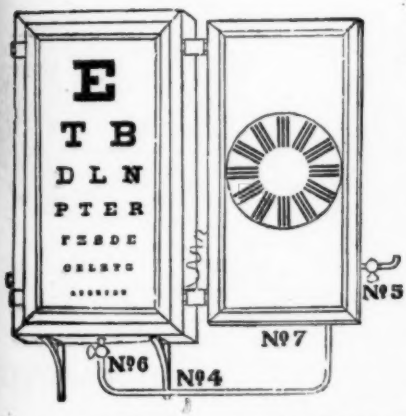

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